REMARKS

This amendment is responsive to the Office Action of December 3, 2003. Reconsideration and allowance of claims 1-22 are requested.

The Office Action

Claims 1-9 and 17-19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Thiel (US 4,887,211) in view of Rodriguez (US 2002/0154146).

Claims 10-13 and 16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Thiel (US 4,887,211) in view of Senn (US 6,338,030) and further in view of Rodriguez (US 2002/0154146).

Claims 14-15 and 20 were indicated as containing an allowable subject matter.

Claims 21-22 are allowed.

The Present Application

The present application is directed to the processing of data in the nuclear camera systems. Both the image data and control data are defined in open, extensible software architecture. Each event data is acquired by a detector and is processed by an image processor. The image data is formatted by an image data processor in the <image.xml> format. A format definition, e.g. <image.dtd>, describing the relationship between pieces of image data is created and stored with the image data file. An acquisition processor controls the detector. The acquisition processor is coupled to a storage medium which contains control data files such as collimator data, isotope data and energy window data, which are stored in xml format. Each of the control files has a pointer to a corresponding format definition file, such as collimator.dtd, isotope.dtd or energywindowsets.dtd.

The References of Record

Thiel is directed to performing a variety of data processing operations for a CT scanner.

Rodriguez is directed to data and image processing. Rodriguez discloses providing the images of alternate resolution and size available for display. It allows user with impaired vision to access larger, higher resolution images. The user accesses the alternate images by means of a selector displayed within the electronic document.

Senn is directed to a spectrophotometer which includes a measuring unit, a controller, and an input/output unit.

<u>Claims 14-15 and 20 are Allowable</u>

Claims 14 and 20 were indicated as allowable if written in an independent form. Claims 14 and 20 were written in an independent form. It is therefore respectfully submitted that **claims 14 and 20 and claim 15** dependent on claim 14 are allowable.

<u>Claims 1-8, 10-11, and 16-19 Distinguish Patentably Over the References of Record</u>

Independent **claims 1, 10 and 17** call for a nuclear camera comprising a detector which acquires radionuclide event data. Thiel is directed to a CT scanner. Rodriguez is directed to data and image processing and discloses providing the images of alternate resolution and size available for display. Initially, Applicants respectfully traverse Examiner's assertion that the CT systems and nuclear medicine machines are "analogous forms of radiation imaging, as many elements in both types of systems are interchangeable." To the contrary, each uses different hardware and different software to get different results. For Examiner's convenience, an article by William Moses, "Scintillator Requirements for Medical Imaging" is attached. The article can be accessed at cfi.lbl.gov/instrumentation/pubs/scint99.pdf.

A CT scanner is a sophisticated X-ray machine that produces a three-dimensional density image of all or part of the body. This is accomplished by measuring the variations in the intensity of a beam of X-rays along each of a plurality of rays. Typically, the CT scanner includes a point source of X-rays, particularly the focal spot of a continuously operated x-ray tube. An array of scintillation crystals is coupled to photodiodes, (See Fig. 3), each receives a continuous flux of x-rays along one ray, which ray is defined by the geometric relationship between the point source

and the detector. The photodiodes operate in a current mode in which their output current varies with variations in the flux or intensity of received radiation. The periodically sampled current values are indicative of the transmission (or inversely the attenuation) along each ray. More specifically, each data value is the line integral of the attenuation along the corresponding ray. The entire assembly rotates around the patient continuously moving and acquiring data along another ray at, for example, 1ms intervals. The line integrals are evaluated, e.g. using a Radon transform based analysis, to determine the relative amount of radiation attenuation at each voxel of a three-dimensional volumetric image. Thus, each voxel or image value represents the radiation attenuation of the corresponding tissue regions (typically function of density).

In nuclear imaging, typically, a distribution of radioisotopes in the body is determined. In SPECT imaging, a radiopharmaceutical is injected into the body. The radioisotopes used in SPECT imaging are gamma ray emitters with emissions between 60keV and 511keV, with the 140keV from Tc-99 being the most common. More specifically, the radioisotopes of the radiopharmaceuticals decay with a half life of typically a half an hour to a few hours. Each time an isotope decays, i.e. a radiation event occurs, it emits a gamma ray. Some of the gamma rays pass through the collimator of a SPECT camera which defines the trajectory. The SPECT camera *counts* the number of individual radiation events (received gamma rays) along each trajectory. These counts are processed into an image depicting the radiopharmaceutical distribution in the body. Because each radioisotope has a characteristic energy, the energy of each counted event is checked to see if it is a valid event (Compton or other scattered radiation changes the energy).

In summary, the CT system reconstructs the line integral of radiation attenuation into a density image; whereas, the nuclear camera reconstructs counts into a distribution image. Since Thiel discloses the CT scanner and not a nuclear medicine machine, Thiel does not meet the ":nuclear camera" limitation of the claims. Because neither Thiel, nor Rodriguez discloses a nuclear camera, it is respectfully submitted that **claims 1, 10, 17 and dependent claims 2-8, 11, and 18-19** distinguish patentably and unobviously over Thiel, Rodriguez and Senn and, as such, are allowable.

Claim 9 Distinguishes Patentably Over the References of Record

Claim 9 calls for among other limitations: an acquisition controller which controls the detector to acquire the event data and accesses control data including at least one of collimator data, isotope data, and energy window data in a respective collimators.xml, isotopes.xml, and energywindowsets.xml data file which each points to one of a corresponding format definition file collimators.dtd, isotopes.dtd, and energywindowsets.dtd. The information collected in collimators.xml, isotopes.xml, and energywindowsets.xml files is specific and to nuclear camera systems. This information is not part of the image data processing in the CT scanners. Thiel is directed to a CT scanner and not concerned with the processing of the collimator, isotope, or the energy window information. Rodriguez is directed to general data and image processing and, like Thiel, is not concerned with the processing of this information. None of the references, taken singularly or in combination, discloses or suggests accessing the collimator, isotope or energy-in-the-window data files each of which has a pointer to the corresponding format definition file collimators.dtd, isotopes.dtd, or energywindowsets.dtd. It is therefore respectfully submitted that **claim 9** distinguishes patentably and unobviously over Thiel, Rodriguez and Senn.

Claims 12, 13 and 16 Distinguish Patentably Over the References of Record

Claim 12 calls for among other limitations: control data including at least one of collimator data, isotope data, and energy window data. Thiel is directed to a CT scanner and not concerned with the processing of the collimator, isotope, or the energy window information. Rodriguez is directed to data and image processing and, similar to Thiel, does not disclose processing collimator, isotope, or energy window data. The CT scanners do not generally require such control information for data acquisition and processing. None of the references, taken singularly or in combination, discloses or suggests use of the collimator, isotope or energy-in-the-window data as disclosed in claim 12. It is therefore respectfully submitted that **claim 12 and dependent claims 13 and 16** distinguish patentably and unobviously over Thiel, Rodriguez and Senn.

CONCLUSION

For the reasons set forth above, it is submitted that **claims 1-22** (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this cases, he is requested to telephone Thomas Kocovsky at (216) 861-5582.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, LLP

Thomas E. Kocovsky, Jr.
Reg. No. 28,383
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518
(216) 861-5582

N:\PKRZ\200876\HMM0000088V001.DOC